



INCH-POUND

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Superseding

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September 1996

DOE STANDARD

HOISTING AND RIGGING **(Formerly Hoisting and Rigging Manual)**



U.S. Department of Energy
Washington, D.C. 20585

AREA SAFT

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DOE STANDARD

HOISTING AND RIGGING

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Summary of Changes as of March 1999



U.S. Department of Energy
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Introduction

The U.S. Department of Energy (DOE) *Hoisting and Rigging Standard* is intended as a reference document to be used by supervisors, line managers, safety personnel, equipment operators, and any other personnel responsible for safety of hoisting and rigging operations at DOE sites. The standard quotes verbatim or paraphrases (with minor editorial changes for consistency) the requirements of the U.S. Occupational Safety and Health Administration (OSHA) and the American National Standards Institute (ANSI). It also encompasses, under one cover, hoisting and rigging requirements, codes, standards, and regulations, eliminating the need to maintain extensive (and often incomplete) libraries of hoisting and rigging standards throughout DOE.

As indicated in the History and Background section, the use of the imperative voice (as in “Never use discarded load chain for slings”) or the word “shall” denotes a mandatory action, whereas use of the word “should” denotes a recommended action in keeping with best management practices.

From chapter to chapter, the reader may notice what appears to be excessive repetition. Such repetition, however, is by design, enabling the use of each chapter, if needed or convenient, as a stand-alone document.

The standard occasionally goes beyond the minimum general industry standards established by OSHA and ANSI; and also delineates the more stringent requirements necessary to accomplish the extremely complex, diversified, critical, and oftentimes hazardous hoisting and rigging work found within the DOE complex. In doing so, it addresses the following items which are not covered in detail in the general industry standards:

1. Management responsibility and accountability
2. Operator/inspector training and qualification requirements
3. Definition of critical lifts and the additional requirements for making them
4. The need and responsibilities of a person-in-charge for critical lifts
5. The need and responsibilities of a designated leader for ordinary lifts
6. The definition and special requirements for preengineered production lifts
7. Special requirements for the testing, inspection, and maintenance of hoisting equipment in hostile environments
8. Nondestructive testing/nondestructive examination requirements for such items as hooks, welds, and spreader bars
9. Special requirements for inspection and load-testing of hoisting and rigging equipment/accessories
10. Hook latch requirements for cranes, slings, and rigging accessories
11. Design standards for such equipment as cranes, forklifts, and hooks
12. Operating practices for hoisting and rigging operations

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13. Rigging information and load tables

14. Good and bad rigging practices.

Because the possibility of serious accidents resulting in personnel injury or death or significant property damage exists whenever hoisting and rigging take place, the requirements for these operations must be clearly defined and precautions ensured, including proper preplanning, extreme care, attention to detail, teamwork on the part of trained operators/riggers, and the use of equipment that is reliable, properly designed, inspected, and maintained. Although not mandatory at all DOE sites and locations, this standard has been used for many years by DOE and its contractors as a valuable resource for conducting hoisting and rigging safely and efficiently and as the standard against which to judge all hoisting and rigging programs. The full implementation of the requirements and recommendations of this standard will dramatically strengthen hoisting and rigging programs throughout the DOE complex and will significantly decrease the probability of serious accidents resulting in personnel injury or death or severe property damage.

~~When organizations operating under nuclear energy programs are required to use DOE document NE F8-6T, those organizations shall use a combination of it and *The DOE Hoisting and Rigging Standard*. Where conflicts exist, this standard shall be given priority since it is being kept current and NE F8-6T has not been revised since 1985.~~

To propose improvements to the standard, please use the copy of the form at the back. All requests or suggestions for improvement should be submitted to:

Hoisting and Rigging Project Manager
U.S. Department of Energy
EH-51, 270 CC
19901 Germantown Road
Germantown, MD 20874-1290

CHAPTER 1 TERMINOLOGY AND DEFINITIONS

CRANE: A machine used for lifting and lowering a load vertically and moving it horizontally and that has a hoisting mechanism as an integral part of it.

CRANES, TYPES OF:

Automatic Crane: A crane that, when activated, operates through a preset cycle or cycles.

Cab-Operated Crane: A crane controlled by an operator in a cab located on the bridge or trolley.

Cantilever Gantry Crane: A gantry or semigantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.

Floor-Operated Crane: A crane whose operation is controlled by use of a pendant in the hands of an operator on the floor or on an independent platform.

Gantry Crane: A crane similar to an overhead crane, except that the bridge for carrying the trolley or

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trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

Jib Crane: A fixed crane with a vertical rotating member supported at the bottom (also at the top in some types) from which an arm extends to carry the hoist trolley. Jib cranes are most commonly mounted on a vertical column, supplied as part of the jib crane, or on existing structural members (e.g., a wall-mounted jib crane).

Mobile Crane: For the purposes of this chapter, mobile cranes are defined as wheel-mounted cranes, truck cranes, and crawler cranes.

Note: Figures 15-1 through 15-10 are located in Chapter 15 “Construction Hoisting and Rigging Equipment Requirements”)

- o A **wheel-mounted** crane consists of a rotating structure with power plant, operating machinery, and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by an engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure (see Figures 15-1, 15-3, 15-5, 15-6, 15-7, 15-9, and 15-10).
- o A **truck-mounted crane** consists of a rotating superstructure with power plant that operates machinery and boom, mounted on an automotive truck equipped with a power plant for travel. Commercial truck-mounted cranes are included in this category (see Figures 15-3, 15-7, 15-9, and 15-10).
- o A **crawler crane** consists of a rotating superstructure with power plant, operating machinery and boom, mounted on a base equipped with crawler treads for travel (see Figures 15-2 and 15-8).

Overhead Traveling Crane: A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed-runway structure.

Power-Operated Crane: A crane whose mechanism is driven by electricity, air, hydraulics, or internal combustion.

Pulpit-Operated Crane: A crane operated from a fixed operator station that is not attached to the crane.

Remote-Operated Crane: A crane controlled by an operator not in a pulpit or a cab attached to the crane, by any method other than pendant or rope control (e.g., radio-controlled crane).

Semigantry Crane: A gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by a truck running on an elevated rail or runway.

Wall-Mounted Crane: A crane having a jib, with or without a trolley, supported from a side wall or line of columns of a building. It is a traveling-type crane and operates on a runway attached to the side wall or line of columns.

Wall-Mounted Jib Crane: See Cranes, Types Of, Jib Crane.

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CRITICAL DIAMETER: Diameter of the smallest bend for a given wire rope that permits the wires and strands to adjust themselves by relative movement while remaining in their normal positions.

PRECISION LOAD POSITIONING DEVICES: A rigging accessory designed specifically to precisely raise and lower a load through a limited range of lifting/lowering motion (stroke). Standards units typically have 12 in. (30 cm) stroke and can position a load within 0.001 in. (0.025 mm). These devices commonly include a built-in load scale and in such cases may also serve as a load-indicating device.

CHAPTER 2 CRITICAL LIFTS

2.2 Critical-Lift Requirements

f. The procedure and rigging sketches shall be reviewed and approved by the responsible manager (or designee) and the responsible oversight organization (such as safety, quality assurance, or quality control) before the lift is made.

g. A pre-lift meeting involving participating personnel shall be conducted prior to making a critical lift. The critical lift plan/procedure shall be reviewed and questions shall be resolved.

h. If required by the critical lift procedure, a practice lift shall be done before the critical lift. Conditions for a practice lift should closely simulate actual conditions involving: weight, rigging selection and configuration, load movement path, and other relevant factors. Practice lifts should be done by the same crew, using the same lifting equipment.

CHAPTER 4 LIFTING PERSONNEL

4.1 General

a. These special procedures shall be followed when lifting personnel:

23. After the personnel platform is positioned, all brakes and locks on the lift crane shall be set before personnel perform any work.

24. No lifts shall be made on another of the crane's load lines while personnel are suspended on a platform.

CHAPTER 6 PERSONNEL QUALIFICATIONS AND TRAINING

6.3.4 Forklift Truck Operators

a. Only qualified and authorized operators shall be permitted to operate powered forklift trucks. Operator trainees may operate powered forklift trucks under the direct supervision of a qualified operator or trainer and only where such operations does not endanger the trainee or other employees.

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b. The initial training of operators shall include:

1. A combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material).
2. Practical training (demonstrations performed by the trainer and practical exercises performed by the trainee).
3. Evaluation of the operator's performance in the workplace including results of written and oral evaluation, and witnessing a demonstration of the operator's skills.

c. The following checklist contains basic factors with which a forklift truck operator should be familiar. This checklist must be tailored to suit actual conditions.

1. Operating instruction, warnings, and precautions for the type of forklift truck the operator will be authorized to operate.
2. Differences between the forklift truck and the automobile.
3. Forklift truck controls and instrumentation:
 - i. Where they are located.
 - ii. What they do.
 - iii. How they work.
4. Engine or motor operation.
5. Steering and maneuvering.
6. Visibility, including restrictions due to loading.
7. Fork and attachment adaptation, operation, and use limitations.
8. Forklift truck capacity and load weight determination.
9. Forklift truck stability and load dynamics.
10. Forklift truck inspections and maintenance that the operator will be required to perform.
11. Refueling and/or charging and recharging of batteries.
12. Operating limitations.
13. Any other operating instructions, warning, or precautions listed in the operator's manual for the type of forklift truck that the employee is being trained to operate.
14. Traveling with and without a load.

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15. Lifting personnel.
 16. Emergency procedures.
 17. Lessons learned.
 18. Hand signals.
 19. Applicable standards and regulations.
 20. Critical lifts.
 21. Modifications.
 22. Terminology and definitions.
 23. Records and documents.
 24. Operating practices.
 25. Fire protection.
- d. Refresher training in relevant topics shall be provided to the operator when:
1. The operator has been observed to operate the forklift truck in an unsafe manner.
 2. The operator has been involved in an accident or near-miss incident.
 3. The operator has received an evaluation that reveals that the operator is not operating the forklift truck safely.
 4. The operator is assigned to drive a different type of forklift truck.
 5. A condition in the workplace changes in a manner that could affect the safe operation of the forklift truck.

CHAPTER 7 OVERHEAD AND GANTRY CRANES

7.2.1 General

a. There shall be no apparent damage, excessive wear, or deformation of any load-bearing part of the equipment. Brakes shall work satisfactorily and load brakes shall be designed to hold any load up to at least 125 percent of the rated stable capacity of the equipment without slipping or overheating. All safety devices, load indicators, controls, and other operating parts of the equipment shall be checked during each inspection and shall be in good working order. Parts found to be defective during any inspection or nondestructive examination shall be replaced or repaired as directed by the responsible line manager or that person's designated representative.

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b. ~~Frequency notation as used in dates for frequent and periodic inspections should be defined as follows:~~

- ~~— 1. Daily 24 hours.~~
- ~~— 2. Weekly 7 days.~~
- ~~— 3. Monthly 31 days.~~
- ~~— 4. Quarterly 92 days.~~
- ~~— 5. Semi annually 184 days.~~
- ~~— 6. Yearly 365 days.~~

e. ~~Violations of inspection periods may be granted on a case by case basis, provided there is a pre-established site specific policy.~~

7.2.3 Initial Inspection

Prior to their initial use, all new, reinstalled, modified, or ~~extensively~~ repaired cranes shall be inspected by a qualified inspector to ensure compliance with applicable provisions of this chapter. Inspections of repaired and modified cranes may be limited to the provisions affected by the alteration, repair, or modification as determined by a qualified person. Dated and signed inspection reports shall be kept on file and shall be readily available.

7.3.1 Operational Tests

a. Prior to initial use, all new, reinstalled, ~~extensively~~ repaired, or modified cranes shall be tested by a designated person to ensure compliance with this chapter, including the following functions:

- 1. Lifting and lowering.
- 2. Trolley travel.
- 3. Bridge travel.
- 4. Locking, limiting, and indicating devices, if provided.
- 5. Limit switches/devices.

7.3.2 Rated Load Test

a. Prior to initial use, all new or reinstalled cranes and cranes in which the load sustaining parts have been altered, modified, repaired, or replaced, or whose rated capacities have been affected shall be tested by or under the direction of a qualified inspector. ~~A designated or authorized person shall determine if repairs made to a crane are extensive, requiring a rated load test, or routine maintenance requiring only operational testing. The replacement of rope is excluded from this requirement. However, a functional test of the crane under a normal operating load should be made prior to putting the crane back in service. A written report shall be furnished by the inspector confirming the load rating of the crane. The load rating should~~

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~~not be more than 80 percent of the maximum load sustained during the test.~~

~~b. The rated load test for new cranes shall consist of the following operations as minimum requirements:~~

~~c. Extensively repaired or modified cranes shall be tested in accordance with paragraph 7.3.2.b above insofar as interfering equipment/structures permit and in accordance with recommendations from the manufacturer or a responsible engineering organization.~~

b. A written report confirming the rated load testing of the crane shall be furnished by the inspector.

c. Test loads shall not be less than 100% or more than 125 percent of the rated capacity, unless otherwise recommended by the manufacturer or a qualified person.

d. Testing shall consist of the following operations as minimum requirements:

1. Hoist the test load a sufficient distance to ensure that the load is supported by the crane and held by the hoist brakes. Personnel shall be kept clear of the test load while it is suspended.

2. Transport the test load by means of the trolley for the full length of the bridge.

3. Transport the test load by means of the bridge for the full length of the runway, in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the extreme left-hand end of the crane as practical.

4. Lower the test load, stopping by the brakes.

e. The replacement of load chain and rope is specifically excluded from this requirement; however, an operational test of the crane shall be made in accordance with para. 7.3.1.a.1 prior to putting the crane back in service.

f. If wire rope clips or wedge socket end connection are installed during wire rope installation:

1. The crane should be cycled several times with a load equal to or greater than the maximum operational load, normally 100% of the rated capacity.

2. If wire rope clips are used, then check and retighten nuts to the wire rope clip or wire rope manufacturer's recommended torque value.

3. If a wedge socket is used, then verify that the rope is properly seated.

g. Operational testing of altered, repaired, or modified cranes whose load sustaining parts or rated capacities have not been affected may be limited to the functions affected by the alteration, repair, or modification as determined by a qualified person.

h. The transporting of test loads as required by paragraphs 7.3.1.a or 7.3.2.a above, shall be done insofar as interfering equipment/structures permit and in accordance with recommendations from the manufacturer or a responsible engineering organization. However, test loads should not be carried over critical systems or components.

i. Test weights shall be accurate to within -5 percent, +0 percent of stipulated values.

7.4.2 Wire-Rope Maintenance

Personnel using wire rope shall ensure proper care by doing the following:

- a. Store rope to prevent damage or deterioration.
- b. Unreel or uncoil rope as recommended by the rope manufacturer and with care to avoid kinking or inducing a twist.
- c. Before cutting rope, use some method to prevent unlaying the strands. ~~Flame cutting wire rope is prohibited.~~ Heat affected zones of flame cut wire rope shall not be allowed to bear load.
- d. During installation, avoid dragging the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends in it.

EXHIBIT I (continued) Page 2 of 4

BRIDGE CRANE AND FOLLOW UP CHECKS

NOTES:

1. Craftsmen shall initial all steps completed below.
2. Qualified inspector shall verify all steps below.
3. Load test shall be performed on all new, ~~extensively~~ repaired, or modified cranes prior to initial use.
4. Load test crane at 125% of rated capacity. In no case shall the load test exceed 125% of rated capacity. Test weights shall be accurate to -5%, + 0% of stipulated values.

CHAPTER 8 HOIST

~~8.2.1 General~~

~~a. Frequency notation as used in dates for frequent and periodic inspections should be defined as follows:~~

- ~~— 1. Daily 24 hours.~~
- ~~— 2. Weekly 7 days.~~
- ~~— 3. Monthly 31 days.~~
- ~~— 4. Quarterly 92 days.~~
- ~~— 5. Semi annually 184 days.~~
- ~~— 6. Yearly 365 days.~~

~~b. Violations of inspection periods may be granted on a case by case basis, provided there is a pre-established site specific policy.~~

8.2.2 Initial Inspection

Prior to their initial use, all new, ~~extensively~~ repaired, or modified hoists shall be inspected by a qualified inspector to ensure compliance with the applicable provisions of ASME B30.11, B30.16, and B30.21. Dated and signed inspection records shall be kept on file and shall be readily available.

8.3.1 Operational Tests

All new hoists shall be tested by the hoist manufacturer. All modified or ~~extensively~~ repaired hoists or hoists that have not been used within the preceding 12 months shall be tested before being placed in service. All tests shall be done by a qualified inspector or under the direction of that inspector as detailed in the following paragraphs.

8.3.2 Proof-Load Test

Test anchorages or suspensions shall be approved by a qualified person.

8.3.2.1 Electric- or Air-Powered Hoists

- a. The manufacturer shall dynamically test new hoists as specified in Section 8.3.1.1 (“Electric- or Air-Powered Hoists”), steps a. and b., with a test load of at least 125 percent of the rated load. If the manufacturer cannot test the hoist, the user shall be notified and the test shall be accomplished at another location or job site by a qualified inspector or under the direction of that inspector.
- b. A qualified inspector shall test hoists in which load suspension parts have been modified, replaced, or ~~extensively~~ repaired as specified in Section 8.3.1.1, steps a. and b. by or under the direction of a qualified inspector, and a record of the test should be made. A designated or authorized person shall determine if repairs made to a hoist are extensive, and require a rated load test, or routine maintenance and require only an operational test. The applied test load shall not be less than 100 percent of the rated capacity of the hoist, or more than 125 percent of the rated capacity of the hoist unless otherwise recommended by the manufacturer or a qualified person. The replacement of load chain and rope is specifically excluded from this hoist test; however, a functional test of the hoist under a normal operating load should be made in accordance with 8.3.1., “Operational Tests,” prior to putting the hoist back in service.

8.3.2.2 Hand-Chain-Operated or Manual-Lever-Operated Hoists

- a. The manufacturer shall dynamically test new hoists with a test load of at least 125 percent of the rated capacity. If the manufacturer cannot test the hoist, the user shall be notified and the test shall be accomplished at another location or job site by a qualified inspector or under the direction of that inspector.
- b. Hoists in which load suspension parts have been modified, replaced, or ~~extensively~~ repaired shall be tested statically or dynamically by or under the direction of a qualified inspector, and a record of the test should be kept. A designated or authorized person shall determine if repairs made to a hoist are extensive and require a rated load test or are routine maintenance and require only an operational test. The applied test load shall not be less than 100 percent of the rated capacity of the hoist or more than 125 percent of the rated capacity of the hoist, unless otherwise recommended by the manufacturer or a qualified person. The replacement of load chain is specifically excluded from this hoist load test; however, a functional test of the hoist should be made in accordance with Section 8.3.1.2 or 8.3.1.3 (“Hand-Chain-Operated Hoists” and

“Manually Lever-Operated Hoists,” respectively), prior to putting the hoist back in service.

CHAPTER 9 MOBILE CRANES

9.1.7 Counterweight

- a. Cranes shall not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly, unusual boom configurations, etc. the crane manufacturer’s recommendations for the amount of ballast or counterweight shall be adhered to.
- b. Ballast or counterweight as specified by the manufacturer shall not be exceeded.

9.2.1 General

- a. Equipment shall operate with a smooth, regular motion without any hesitation, abnormal vibration, binding, gross shimmy, or irregularity. There shall be no apparent damage, excessive wear, or deformation of any load-bearing part of the equipment. All safety devices, load indicators, boom angle and radius indicators, controls, and other operating parts of the equipment shall be checked during each inspection and shall be in good working order.

~~b. Frequency notations as used in dates for frequent and periodic inspections should be defined as follows:~~

- ~~— 1. Daily 24 hours.~~
- ~~— 2. Weekly 7 days.~~
- ~~— 3. Monthly 31 days.~~
- ~~— 4. Quarterly 92 days.~~
- ~~— 5. Semi annually 184 days.~~
- ~~— 6. Yearly 365 days.~~

~~e. Violations of inspection periods may be granted on a case by case basis, provided there is a pre-established site specific policy.~~

9.4.3 Wire-Rope Maintenance

Personnel using wire rope shall ensure proper care by doing the following:

- a. Store rope to prevent damage or deterioration.
- b. Unreel or uncoil rope as recommended by the rope manufacturer and with care to avoid kinking or inducing a twist.

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c. Before cutting a rope, ~~place seizing on each side of the place where the rope is to be cut~~ use some method to prevent unlaying the strands. ~~Flame cutting wire rope is prohibited.~~ Heat-affected zones of flame cut wire rope shall not be allowed to bear load.

d. During installation, avoid dragging the rope in the dirt or around objects which will scrape, nick, crush, or induce sharp bends in it.

9.5.1 Conduct of Operator

r. Use power lowering when lowering loads. When lowering heavy loads, keep the hoist brake as reserve. Use a safety pawl on the boom-hoist drum when not lowering.

s.. Avoid two-blocking, caused when the hook block makes contact with boom-point sheaves. A continuing pull on the hoist lines can break the rope or pull the boom back over the cab on some types of booms. On hydraulically telescoping booms, be sure to play out the hoist line when extending and spool in the hoist line when retracting.

t. Lock carrier air brakes ON when operating, and check the pressure of the air brakes frequently.

u. Watch out for the carrier-cab on truck-mounted units when swinging the boom. Keep boom high enough to swing clear of cab.

v. In the absence of crane manufacturer's instructions regarding maximum wind speeds for operation, operations undertaken at wind speeds in excess of 25 mph should be evaluated by a qualified person to determine if the size, shape and weight of the load can be safely lifted.

w. When a crane is to be operated at a fixed radius, the boom-hoist pawl or other positive locking device shall be engaged.

x. On truck-mounted cranes, no loads shall be lifted over the front area, except as approved by the crane manufacturer.

y. Crane cabs, necessary clothing and personal belongings shall not interfere with access or operations.

z. Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.

9.5.7 Attaching the Load

a. Ensure that the hoist rope is free from kinks or twists. Do not wrap the hoist rope around the load.

b. Ensure that the load is attached to the load-block hook by means of slings or other approved devices.

c. Ensure the load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.

d. Take care to make certain that the sling clears all obstacles.

9.5.8 Moving the Load

- e. Avoid carrying loads over people.
- f. No hoisting, lowering, swinging, or traveling shall be done while anyone is on the load or hook, except as noted in Chapter 4, “Lifting Personnel.”
- g. Test the brakes each time a load approaching the rated capacity is handled by raising the load a few inches and applying the brakes.
- h. Do not lower the load below the point where less than two full wraps of rope remain on the hoist drum.
- i. Do not leave your position at the controls while the load is suspended, unless required to do so by an approved emergency procedure.
- j. If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive controllable means of the operator’s station.
- k. Work on suspended loads is prohibited under normal conditions. When the responsible manager decides that it is necessary to work on a suspended load, guidelines for ensuring safety of the work shall be established through consultation with the appropriate safety organization. Suspended loads that must be worked on shall be secured against unwanted movement.

CHAPTER 10 FORKLIFT TRUCKS

Chapter 10 was totally re-written to ensure all applicable requirements of 29 CFR 1910.178 “Powered Industrial Trucks,” ASME B56.1 “Safety Standard for Low Lift and High Lift Trucks” and B56.6 “Safety Standard for Rough Terrain Forklift Trucks” are incorporated.

CHAPTER 11 WIRE ROPE AND SLINGS

11.3.2.2 Proof-Testing

- a. All swaged socket and poured socket sling assemblies shall be certified as having been proof-tested. All other sling assemblies shall be proof- tested when specified by the purchaser.

11.2.5 Wire-Rope Maintenance

Personnel using wire rope shall ensure proper care by doing the following:

- a. Store rope to prevent damage or deterioration.
- b. Unreel or uncoil rope as recommended by the rope manufacturer or a qualified person and with care to avoid kinking or inducing a twist.
- c. Before cutting a rope, use some method to prevent unlaying of the strands. ~~Flame-cutting wire rope is~~

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~~prohibited.~~ Heat-affected zones of flame cut wire rope shall not be allowed to bear load.

11.3.2.3 Operations

a. Ordinary Lifts

11. Use protector pads or blocking at sharp corners.
12. Keep hands and fingers out of the area between the sling and the load.
13. Ensure that the weight of the load is within the rated capacity of the sling.
14. Do not use damaged slings.
15. Ensure that all personnel stand clear of the suspended load.
16. Avoid shock loading.
17. In a basket hitch, ensure that the load is balanced to prevent slippage.
18. Avoid handling hot material with wire-rope slings.

11.3.3 Alloy Steel-Chain Slings.

k. The safe-load level of any chain sling is a function of three basic factors: size and number of legs, condition of chain and other components, and sling angle between legs and horizontal. Table 11-10 shows safe loads in pounds per leg which can be carried by various chain-sling arrangements. Note the effect of very low hook height and wide leg spreads.

l. *Attachments:* Hooks, rings, oblong links, pear shaped links, welded or mechanical coupling links and other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component.

CHAPTER 12 RIGGING ACCESSORIES

12.4 Eyebolts

a. This section specifies requirements for eyebolts that are used as rigging hardware during normal hoisting and rigging activities. Eyebolts designed for and permanently installed on existing engineered equipment are considered part of the engineered equipment, and they may not meet all requirements specified for rigging hardware. Eyebolts permanently installed on engineered equipment are acceptable for their intended use so long as they pass normal visual inspection before use. It is important to know how the manufacturer or engineered equipment intends permanently installed eyebolts to be used. In some cases the intended use is obvious to an experienced craftsman in other cases engineering review of vendor information may be necessary.

CAUTION: Eyebolts installed by the manufacturer to lift only parts of the engineered equipment are not suitable for lifting the completed piece of equipment. When questions arise regarding the use of

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manufactured-installed eyebolts, the equipment custodian or cognizant engineer shall be consulted.

b. Eyebolts used for hoisting shall be fabricated from forged carbon or alloy steel.

c. Eyebolt marking:

1. Carbon Steel Eyebolts shall have the manufacturer's name or identification marked forged in raised characters on the surface of the eyebolt.

2. Alloy Steel Eyebolts shall have the symbol "A" (denoting alloy steel) and the manufacturer's name or identification mark forged in raised characters on the surface of the eyebolt.

d. Eyebolts shall have a minimum design factor of 5:1. ~~The vertical safe working load shall be forged, stamped, or inscribed into each eyebolt by the manufacturer or the owner. A permanently attached metal tag bearing the same information may also be used.~~

12.9 Precision Load Positioners

a.. A precision load positioning device in the load path shall have a design factor of no less than 5:1, based on ultimate strength of the device's load bearing components.

b. A precision load positioner shall be operated, maintained, calibrated and tested in accordance with the manufacturer's instructions.

c. Prior to initial use, all new, repaired, and altered precision load positioning devices shall be load tested, and a written report shall be furnished, confirming the load rating. If the load test is not performed by the manufacturer, it shall be done under the direction of a designated or authorized person in strict compliance with the manufacturer's instructions. Special attention should be paid to the manufacturer's instructions concerning testing of devices equipped with load gages as they may be damaged during the load test.

CHAPTER 13 LOAD HOOKS

13.2.4 Frequent Inspection

a. Operators or other designated personnel shall visually inspect the hook at the following intervals (records are not required) :

1. Normal service—monthly. Operation at less than 85 percent of rated capacity except for isolated instances.

2. Heavy service—weekly to monthly. Operation at 85 to 100 percent of rated capacity as a regular specified procedure.

3. Severe service—daily to weekly. Operation at heavy service coupled with abnormal operating conditions, (i.e., extreme temperatures, corrosive atmospheres, etc.)

CHAPTER 14 BELOW-THE-HOOK LIFTING DEVICES

This chapter provides the requirements for below-the-hook lifting devices used in hoisting and rigging, such as spreader bars, lifting yokes, and lift fixtures. This section implements the requirements of ASME B30.20, “Below-the-Hook Lifting Devices.”

NOTE: Special lifting devices for shipping containers weighing 10,000 lb or more that are used for radioactive materials may be governed by ANSI N14.6 [“Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More for Nuclear Materials.”]

14.1 General

~~a. Special lifting devices for shipping containers weighing 10,000 lb or more that are used for radioactive materials are may be governed by ANSI N14.6 [“Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More for Nuclear Materials.”]~~

a. Below-the-hook lifting devices are arranged in the following groups because of the diversity of types:

1. Structural and mechanical lifting devices.
2. Vacuum lifting devices.
3. Close-proximity-operated magnets.
4. Remote-operated magnets.

14.2.6 Testing

14.2.6.1 Operational Test

~~NOTE: Special lifting devices for shipping containers weighing 10,000 lb or more that are used for radioactive materials must be tested in accordance with ANSI N14.6.~~

a. Modified or repaired lifting devices shall be tested before initial use to ensure compliance with the requirements of this section (test reports kept on file). Testing shall include the following:

CHAPTER 15 CONSTRUCTION EQUIPMENT HOISTING & RIGGING REQUIREMENTS

15.3.2 Qualified Operators of Forklift Trucks

a. Physical qualifications shall be based on specific job requirements.

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- b. Operators shall be required by the employer to pass a practical operating skill evaluation. Qualification shall be limited to the type of forklift for which the operator is being evaluated.
- c. The actual or simulated operation shall enable operators to demonstrate basic knowledge and skills at a level that ensures the safety of personnel and equipment.
- d. Only qualified and authorized operators shall be permitted to operate powered forklift trucks. Operator trainees may operate powered forklift trucks under the direct supervision of a qualified operator or trainer and only where such operations does not endanger the trainee or other employees.
- e. The initial training of operators shall include:
 - 1. A combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material).
 - 2. Practical training (demonstrations performed by the trainer and practical exercises performed by the trainee).
 - 3. Evaluation of the operator's performance in the workplace including results of written and oral evaluation, and witnessing a demonstration of the operator's skills.
- f. The following checklist contains basic factors with which a forklift truck operator should be familiar. This checklist must be tailored to suit actual conditions.
 - 1. Operating instruction, warnings, and precautions for the type of forklift truck the operator will be authorized to operate.
 - 2. Differences between the forklift truck and the automobile.
 - 3. Forklift truck controls and instrumentation:
 - i. Where they are located.
 - ii. What they do.
 - iii. How they work.
 - 4. Engine or motor operation.
 - 5. Steering and maneuvering.
 - 6. Visibility, including restrictions due to loading.
 - 7. Fork and attachment adaptation, operation, and use limitations.
 - 8. Forklift truck capacity and load weight determination.
 - 9. Forklift truck stability and load dynamics.
 - 10. Forklift truck inspections and maintenance that the operator will be required to perform.

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11. Refueling and/or charging and recharging of batteries.
 12. Operating limitations.
 13. Any other operating instructions, warning, or precautions listed in the operator's manual for the type of forklift truck that the employee is being trained to operate.
- g. Refresher training in relevant topics shall be provided to the operator when:
1. The operator has been observed to operate the forklift truck in an unsafe manner.
 2. The operator has been involved in an accident or near-miss incident.
 3. The operator has received an evaluation that reveals that the operator is not operating the forklift truck safely.
 4. The operator is assigned to drive a different type of forklift truck.
 5. A condition in the workplace changes in a manner that could affect the safe operation of the forklift truck.

15.4.1 General

c. Equipment with deficiencies that may affect the safety of the operation shall not be allowed to operate at DOE installations. No repairs, modifications, or additions that affect the capacity or safe operation of the equipment shall be made by the contractor without the manufacturer's written approval. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer. Dated and signed records shall be kept on file.

15.4.4 Forklift Trucks— Inspection

- a. Prior to initial use, all new, modified, or repaired forklifts shall be inspected by a qualified inspector to ensure compliance with the provisions of this section.
- b. A scheduled planned inspection, maintenance, and lubrication program shall be followed; consult the manufacturer's recommendations.
- c. Only trained and authorized personnel shall be permitted to inspect, maintain, repair, and adjust forklift trucks; these services shall be performed in accordance with manufacturer's specifications. Items listed in the following paragraphs shall be regularly inspected.
8. Attachments shall be included in a scheduled maintenance/inspection program. Inspection steps shall be tailored for the attachment. Load-bearing components shall be examined for deformation and load-bearing welds shall be visually examined for cracks. Mechanical or hydraulic components shall be inspected and maintained in accordance with the manufacturer's instructions.
 9. Attachments shall be inspected not less than annually and the inspection should be documented.
 10. Fork inspection shall be carried out by a qualified inspector with the aim of detecting any damage,

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failure, deformation, or other condition that might impair safe use. A fork that shows any of the following defects shall be withdrawn from service, and shall not be returned to service until it is satisfactorily repaired by the fork manufacturer or an expert of equal competence. Fork inspection shall include:

- i. *Surface Cracks* - A thorough visual examination for cracks and, if considered necessary, non-destructive crack detection, with special attention to the heel and to the welds that attach the mounting components to the fork blank. Inspection for cracks shall include any mounting mechanisms of the fork blank to the fork carrier. Forks shall not be returned to service if surface cracks are detected.
- ii. *Fork Tine Inspection* - Examination for straightness of blade and shank, fork angle (upper face of blade to load face of the shank), fork blade and shank wear. Difference in height of fork tips may vary from manufacturer to manufacturer and with tine length. For these reasons, fork tine inspections shall be done in accordance with manufacturers requirements.
- iii. *Positioning Lock* - Confirm that the Positioning Lock (when provided), is in good repair and in correct working order. If any fault is found, the fork shall be withdrawn from service until satisfactory repairs are made.
- iv. *Fork Hooks Wear* - When fork hooks are provided, the support face of the top hook and the retaining faces of both hooks shall be checked for wear, crushing, and other local deformations.
- v. *Fork Marking* - When fork marking is not clearly legible, it shall be renewed. Marking shall be renewed per instructions from the original fork supplier.

15.4.5 Forklift Trucks—Testing

Forklift truck load tests are not routinely required.

- a. Load tests shall not be conducted until verification that inspection and maintenance is up to date.
- b. Load tests shall be performed after major repair or modification to components that affect the load-carrying ability of the truck.
- c. The manufacturer should be consulted if questions arise as to whether a load test is appropriate.
- d. Forklift trucks shall be load tested by or under the direction of a qualified person and in accordance with the manufacturer's recommendations.
- e. Test weights shall be accurate to within -5 percent, +0 percent of stipulated values.
- f. Load-test records shall be maintained and shall be made available for examination by the construction management contractor.
- g. A load test shall not be conducted in locations such that the lift meets the definition of critical lift in Section 15.2.
- h. A fork that has undergone repair, other than repair or replacement of positioning locks or marking, shall be subject to a load test as described in ASME B56.1, Section 7.25, "Forks," Item 3, which lists loading and method of test for forks; except for the test load, which shall correspond to 2.5 times the rated capacity marked on the fork.

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- i. Load capacity of an attachment shall be verified by the manufacturer or by a load test at 100 % capacity that is performed onsite. Load tests are not routinely required since a catalog cut, user's manual, decals on attachment, or other manufacturer's data serves as capacity verification.

15.4.9 Rigging Accessories Testing

- a. Tackle assemblies, handling fixtures, and rigging accessories for critical-lift service shall have an initial proof-load test of 2 times the rated capacity. The tackle shall be proof-tested prior to making a critical lift if proof-testing cannot be verified.
- b. Tackle assemblies, handling fixtures, and rigging accessories that have been modified or extensively repaired shall be proof-tested again to 2 times the rated capacity prior to making a critical lift.
- c. Test loads shall be accurate to within -5 percent, +0 percent of stipulated values.

15.5.2 Mobile Cranes/Boom Trucks

- a. Never use signs of tipping to determine if a load is within a crane's capacity. Operating by the "seat of the pants" is an unacceptable practice.
- b. Know the rated capacity of the crane. A safe lift depends on boom length, boom angle, and working radius. Follow these suggestions to avoid structural failure or tipping:
 1. Know the radius of the load. Remember that the radius is measured from center of rotation, not from the boom foot pins.
 2. Always operate within the rated capacity of the machine.
 3. Subtract the weight of hooks, blocks, and any other material-handling devices (slings, shackles, spreader bars, etc.) from the gross capacity of the crane to determine if the load can be lifted safely.
 4. Load chart ratings are based on operating the machine on firm, level ground. Outriggers shall be fully extended and lowered so that all wheels are clear of the ground, unless otherwise specified on the manufacturer load charts for the crane. Otherwise, "on rubber" load charts shall be used.
 5. Avoid rapid changes in velocity while hoisting, swinging, or lowering the load; these can cause overloads when operating at or near the crane's capacity.
 6. Do not lift large, heavy loads in strong winds. Wind loading can be critical depending on boom length, boom angle, bulkiness of the load, wind direction, and wind velocity.
 7. In the absence of crane manufacturer's instructions regarding maximum wind speeds for operation, operations undertaken at wind speeds in excess of 25 mph should be evaluated by a qualified person to determine if the size, shape and weight of the load can be safely lifted.
- c. Always use the shortest boom possible, and observe these precautions with any boom length:
 1. Make only vertical lifts. Never pull the load sideways.
 2. Keep speed slow in lifting, lowering, and stopping loads.

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3. Do not let the load strike the boom or outriggers and never allow a crane boom to hit or touch any structure. (Boom contact could dent or bend the lower boom chords and may cause a total boom collapse.) Boom contact with any object shall require an engineering evaluation prior to putting the crane back in service. Damage to the crane sustained during operation shall be repaired according to manufacturer's specifications using certified welders. A reinspection or load test is required after repairs are complete, as is a recertification by the construction management contractor at the subcontractor's expense indicating that the unit can return to service.

4. Allow maximum clearance between the hook block and boom point sheaves.

5. Keep near-capacity loads as close to the ground as possible.

d. Cranes shall not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly, unusual boom configurations, etc. the crane manufacturer's recommendations for the amount of ballast or counterweight shall be adhered to. Ballast or counterweight as specified by the manufacturer shall not be exceeded.

e. Rotate the crane slowly to avoid an outward swing of the load. Attach a tag line to the load to control the swing.

f. Keep the boom high enough to swing clear of the cab when rotating the crane on truck-mounted units.

g. Watch for boom kickback. Never operate with the boom at a higher angle than shown on the capacity chart.

h. Avoid "two-blocking," which is caused when the hook block collides with boom-point sheaves. Continuous pull on hoist ropes can break the ropes or might pull the boom over the cab. On hydraulically telescoping booms, be sure to play out the hoist rope when extending and reel in the hoist rope when retracting.

i. On truck-mounted cranes, no loads shall be lifted over the front area, except as approved by the crane manufacturer.

15.5.2.6 Critical Lifts

f. The procedure and rigging sketches shall be reviewed and approved by the responsible manager (or designee) and the responsible oversight organization (such as safety, quality assurance, or quality control) before the lift is made.

g. A pre-lift meeting involving participating personnel shall be conducted prior to making a critical lift. The critical lift plan/procedure shall be reviewed and questions shall be resolved.

h. If required by the critical lift procedure, a practice lift shall be done before the critical lift. Conditions for a practice lift should closely simulate actual conditions involving: weight, rigging selection and configuration, load movement path, and other relevant factors. Practice lifts should be done by the same crew, using the same lifting equipment.

15.5.2.7 Lifting Personnel

k. These special procedures shall be followed when lifting personnel:

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17. After the personnel platform is positioned, all brakes and locks on the lift crane shall be set before personnel perform any work.

18. No lifts shall be made on another of the of the crane's load lines while personnel are suspended on a platform.

19. Cranes and derricks with variable-angle booms shall be equipped with a boom-angle indicator that is readily visible to the operator.

15.5.3 Forklift Trucks

a. Know the rated capacity of the forklift and always operate within that capacity. Since the load rating for forklifts may be based on stability or hydraulic/structural competence, the rated capacity shall not be exceeded in operational application. Signs of tipping shall never be used to determine if a load is within the forklift's capacity.

b. Attachments almost always affect rated capacity of the truck. When a forklift truck is equipped with an attachment, the rated capacity of the truck/attachment combination shall be established by the truck manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

1. The rated capacity of an attachment/truck combination shall not be exceeded.

2. On every removable attachment (excluding fork extensions), a corrosion-resistant nameplate with the following information is required:

i. Model number

ii. Serial number on hydraulically actuated attachments

iii. Maximum hydraulic pressure (on hydraulically actuated attachments)

iv. Weight

v. Capacity

vi. The following instructions (or equivalent); "Capacity of truck and attachment combination may be less than capacity shown on attachment. Consult truck nameplate."

NOTE: The above information should be provided by the attachment manufacturer.

c. Modifications or additions that affect capacity or safe operation shall not be performed without prior written approval from the forklift truck manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

d. Ensure that battery recharging and maintenance takes place in designated areas where smoking, sparks, or open flames are prohibited. Verify the location and operability of eyewash and shower facilities before maintenance is performed. Wear eye protection, rubber gloves, and rubber aprons. Whenever battery maintenance is performed, any area of the body affected by contact with battery electrolyte shall be flushed with water immediately and all acid spills must be cleaned up at once.

15.5.3.1.1 General

- a. Safe operation is the responsibility of the operator. Report all accidents and "near misses" promptly.
- b. The operator shall develop safe working habits and also be aware of hazardous conditions in order to protect himself, other personnel, the truck, and other material.
- c. The operator shall be familiar with the operation and function of all controls and instruments before operating the truck.
- d. Before operating any truck, the operator shall be familiar with unusual operating conditions which may require additional safety precautions or special operating instructions.
- e. Be certain the truck has successfully passed a preuse inspection. A sample Pre-operational inspection checklist is included as Exhibit 1, which appears at the end of this chapter.
- f. Do not start or operate the truck, any of its functions or attachments, from any place other than from the designated operator's position.
- g. Keep hands and feet inside the operator's designated area or compartment. Do not put any part of the body outside the operator compartment of the truck.
- h. Never put any part of the body within the reach mechanism of the truck or other attachments.
- i. Avoid reaching through the mast for any purpose.
- j. To safeguard pedestrians, understand the truck's limitations and observe the following precautions:
 - 1. Do not drive a truck up to anyone standing in front of an object.
 - 2. Ensure that personnel stand clear of the rear swing area before conducting turning maneuvers.
 - 3. Exercise particular care at cross aisles, doorways, and other locations where pedestrians may step into the path of travel of the truck.
 - 4. Do not allow anyone to stand or pass under the elevated portion of any truck, whether empty or loaded.
- k. Do not permit passengers to ride on powered industrial trucks unless a safe place to ride has been provided by the manufacturer.
- l. Ensure that fire aisles, access to stairways, and fire equipments is kept clear.
- m. A powered industrial truck is considered unattended when the operator is more than 25 ft. (7.6m) from the truck, which remains in his view, or whenever the operator leaves the truck and it is not in his view.
- n. Before leaving the operator's position the operator shall perform the following :
 - 1. Bring truck to a complete stop.

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2. Place directional controls in neutral.
 3. Apply the parking brake.
 4. Fully lower load-engaging means, unless supporting an elevated platform.
- o. In addition, when leaving the truck unattended the operator shall perform the following:
1. Stop the engine or turn off the controls.
 2. If the truck must be left on an incline, block the wheels.
 3. Fully lower the load-engaging means.
- p. Maintain a safe distance from the edge of ramps, platforms, and other similar working surfaces. Do not move railroad cars with a powered industrial truck.
- q. Do not use a truck for operating or closing railroad car doors except as follows:
1. Unless the truck utilizes a device specifically designed for opening and closing railroad car doors and the operator is trained in its use.
 2. The design of the door-opening device shall require the truck to travel parallel to the railroad car, with the force applied in a direction parallel with the door travel.
 3. Care should be exercised when engaging the railroad car door with the door opening device, in order to prevent damage to the doors and/or fork truck by heavy impact forces.
 4. The entire door opening operation shall be in full view of the operator.
 5. The fork truck shall always be positioned to safeguard the dock attendant while removing the door lock pin.
 6. Whenever a railroad car door requires an abnormal force to open, the truck operator shall report the condition to his supervisor.
- r. Wheel stops, hand brakes, or other recognized positive protection shall be provided to prevent railroad cars from moving during loading or unloading operations.
- s. Consider both the truck and load weight when operating in railcars and semitrailers.
- t. Inspect floors on trucks, boxcars, unfamiliar ramps, or platforms before start of operation.
- u. Other workers should not be inside the truck when the forklift truck is performing loading or unloading operations. Load arrangements and spacing issues should be determined before the forklift enters the truck.
- v. Fixed jacks or supports may be needed to prevent upending or corner dipping when powered industrial trucks are driven on and off semitrailers that are not coupled to the tractor.
- w. The brakes of highway trucks shall be set and wheel chocks placed under the rear wheels to prevent the

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trucks from rolling while they are boarded.

x. Care shall be taken to not contact overhead installations such as lights, wiring, pipes, sprinkler systems, etc. If in doubt, measure.

y. Motorized hand trucks shall not be ridden unless they are of the hand/rider design.

5.5.3.1.2 Traveling

a. Observe all traffic regulations and under all travel conditions, operate the truck at a speed that will permit it to be brought to a stop in a safe manner. Unless facility-specific procedures state otherwise, the guideline is: within plant buildings - 5 mph; on plant roads - 15 mph. Drive slowly around curves.

b. Yield the right of way to pedestrians and emergency vehicles. Whenever possible, establish eye contact with approaching pedestrians or vehicle drivers before continuing.

c. Do not pass another truck traveling in the same direction at intersections, blind spots, or at other locations where vision is obstructed.

d. Slow down and sound horn at cross aisles and other locations where vision is obstructed.

e. Railroad tracks shall be crossed diagonally whenever possible.

f. Never travel with forks raised to unnecessary heights. Approximately 4 to 6 inches (10 to 15 cm) above floor level is adequate.

g. Do not park closer than 6 ft (1800 mm) to the nearest rail or a railroad track.

h. Face in the direction of travel, except if the load being carried obstructs forward view. In such cases travel with the load trailing.

i. When ascending or descending grades, ramps, and inclines:

1. In excess of 5 percent grade, drive loaded rider trucks with the load upgrade.

3. Use low gear or slowest speed control.

4. Operate unloaded trucks with the load-engaging means downgrade.

5. The load and load-engaging means shall be tilted back, if applicable and raised only as far as necessary to clear the road surface.

6. Avoid turning if possible, and normally travel straight up and down.

j. While turning, be cautious of rear end swing and keep clear of the edge of loading docks.

k. Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift load and/or overturn the truck.

l. Do not indulge in stunt driving or horseplay.

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- m. Slow down for wet and slippery floors.
- n. Before driving over a dockboard or bridge plate, be sure that it is properly secured.
- o. Drive carefully and slowly across the dockboard or bridge plate, and never exceed its rated capacity.
- p. Do not drive trucks onto any elevator unless specifically authorized to do so. In cases operation are authorized:
 - 1. Do not exceed the capacity of the elevator.
 - 2. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled.
 - 3. Once on the elevator, neutralize the controls, shut off the power, and set brakes.
 - 4. It is advisable that all other personnel leave the elevator before truck is allowed to enter or leave.
- q. Unless a towing hitch is supplied by the manufacturer, do not use forklift trucks as tow trucks. When a towing hitch is provided, use tow bars rather than wire rope for towing.
- r. At the end of the operator's shift, return the forklift truck to its assigned parking place, set brakes, fully lower load-engaging means, place controls in neutral position, turn ignition off, and secure the key.
- s. If the truck is equipped with a seat belt, use it.

15.5.3.1.3 Loading

- a. Since the load rating for forklifts may be based on stability or hydraulic or structural competence, do not exceed the rated capacity in operational application.
- b. The designated person shall ensure that the weight of a load approaching the rated capacity (combination of weight and location of the center of gravity) has been determined within -10 percent, +0 percent before it is lifted.
- c. Only stable, safely arranged loads shall be handled. Block and secure them if necessary.
- d. Caution shall be exercised when handling off-center loads which cannot be centered.
- e. Always spread the forks to suit the load width.
- f. Extra caution is required when handling loads exceeding the dimensions used to establish truck capacity. Stability and maneuverability may be adversely affected.
- g. The forks shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.
- h. Do not transport loads or miscellaneous items within the operator's compartment or other areas of the truck, unless a secure area has been provided and designated by the user.
- i. A load backrest extension shall be used whenever necessary to minimize the possibility of the load or

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part of it from falling rearward.

- j. Do not attach or operate any attachment on a forklift truck that has not been approved for use by the forklift truck manufacturer.
- k. When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load.
- l. Operate trucks equipped with attachments as partially loaded trucks when not handling a load.
- m. Fork length should be at least two thirds of the load length.
- n. Use extreme care when tilting load forward or backward, particularly when high tiering.
- o. Do not tilt forward with forks elevated except to pick up or deposit a load over a rack or stack.
- p. When stacking or tiering, use only enough backward tilt to stabilize the load.
- q. Do not rig loads from the tines of a forklift truck, (attaching rigging to the forks to support a suspended load) without written management approval.
- r. Never lift with one fork without an engineering analysis and approval.
- s. Use guides and signalers as necessary. If in doubt, check the conditions personally before proceeding. Standard hand signals are shown in Figure 15.17 "Hand Signals."
- t. Do not block fire extinguishers, fire protection sprinklers, or alarm stations when stacking loads.

15.5.3.4 Lifting of Personnel

If a work platform is used on forklift trucks designed and intended for handling materials, take the following precautions:

- a. Use a lift platform manufactured for the purpose of lifting personnel with a forklift truck. The platform shall include:
 - 1. A 4-in. (10-cm) minimum height toe plate provided on the work platform.
 - 2. The floor of the platform located not more than 8-in (20-cm) above the upper face of the supporting truck fork blade.
 - 3. A restraining means such as a guard rail having a height above the platform floor of not less than 36 in. (90-cm) or more than 42 in. (110-cm) around its upper periphery and including a midrail.
 - 4. An access opening in the guard rail maybe hinged or removable, or chains may be used if proper positioning is easily accomplished and a secured condition is discernible.
 - 5. Guard rails and access openings shall be capable of withstanding a concentrated force of 200 lb (91 kg) in any direction.

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6. Means to securely attach the platform to the lifting carriage or forks in such a manner that it cannot slide or bounce off the forks.
7. Means to correctly locate the platform centered laterally on the truck.
8. Floor dimensions that neither exceed two times the load center distance listed on the truck nameplate, measured parallel to the longitudinal center plane of the truck, nor have a width greater than the overall width of the truck (measured across the load bearing tires) plus 10 in. (25-cm) on either side.
9. The following information should be prominently indicated on the platform:
 - I. maximum load including personnel and equipment;
 - ii. weight of empty platform;
 - iii. minimum capacity of the truck on which the platform can be used.
- b. The combined weight of the platform, load, and personnel shall not exceed one-half of the capacity as indicated on the nameplate of the truck on which the platform is used.
- c. Whenever a truck (except for high-lift order-picker trucks) is equipped with vertical hoisting controls elevatable with the lifting carriage or forks, take the following additional precautions to protect personnel:
 1. Means shall be provided whereby personnel on the platform can shut off power to the truck.
 2. Means shall be provided to render inoperative all operating controls on the elevating platform, when the controls on the elevating platform have been selected for use; only one location of controls shall be capable of being operated at one time.
 3. Emergency-lowering means available at ground level should be provided; such means shall be protected against misuse.
- d. Take the following precautions whenever personnel are elevated with a forklift truck:
 1. Ensure the truck has a firm and level footing.
 2. Place all travel controls in neutral and set parking brake.
 3. Before elevating personnel, mark area with cones or other devices to warn of work by elevated personnel.
 4. Lift and lower personnel smoothly, with caution, and only at their request.
 5. Avoid overhead obstructions and electric wires.
 6. Keep hands and feet clear of controls other than those in use.
 7. Move truck and/or platform slowly, only for minor adjustments in horizontal positioning when personnel are on the platform, and only at their request.
 8. Ensure the mast is vertical - do not operate on a side slope.

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9. The platform is horizontal and never tilted forward or rearward when elevated.
10. Personnel are to remain on the platform floor. The use of railings, planks, ladders, etc., on the platform for the purpose of achieving additional reach or height is prohibited.
11. Ensure personnel and equipment on the platform do not to exceed the available space.
12. Lower platform to floor level for personnel to enter and exit. Do not climb on any part of the truck in attempting to enter or exit.
13. The operator shall remain in the control position of the forklift truck.
14. Be certain that the lifting mechanism is operating smoothly throughout its entire lift height, both empty and loaded, and that lift limiting devices and latches, if provided, are functional.
15. Means shall be provided to protect personnel from moving parts of the forklift truck that present a hazard when the personnel platform is in the normal working position.
16. Overhead protection, as necessary for operating conditions, shall be provided.
17. Do not transport personnel from one location to another while they are on the work platform.
18. When not in the operating position, engage the parking brake and block the wheels.
19. Be certain that required restraining means such as railings, chains, cable, body belts with lanyards, or deceleration devices, etc., are in place and properly used.

EXHIBIT I OPERATORS PRE-SHIFT INSPECTION **(sheet 1 of 2) ELECTRIC FORKLIFT** **(sheet 2 of 2) *GAS, LP, or DIESEL FORKLIFT***

CHAPTER 16 REFERENCES

American National Standards Institute

ANSI A10.28-~~1990~~, Work Platforms Suspended From Cranes or Derricks.

ANSI A10.18-~~1983~~, Floor and Wall Openings, Railings and Toe Boards.

ASME B30.2-~~1990~~, Overhead and Gantry Cranes (Top-Running Bridge, Single or Multiple Girder, Top-Running Trolley Hoist).

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~~—B30.2b-1992~~

ASME B30.5-~~1994~~, Mobile and Locomotive Cranes.

ASME B30.6-~~1990~~, Derricks.

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~~B30.6a—1991~~
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APPENDIX A

PROCUREMENT GUIDELINES